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EXPERIMENT STATION.—Circular No. 12.

DIVISION OF BOTANY.

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Treatment of Seed Wheat for Smut.

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Wheat is infected by two kinds of smut, known respectively as the "loose smut" and the "stinking smut," or "bunt." In the case of the latter, particularly, the smut may be controlled by the treatment of the seed wheat. The best treatment for the prevention of stinking smut is by what is known as the formaldehyde method, as follows: Mix one pound (= 1 pint) of commercial 40 per cent formaldehyde with 50 gallons of water. *This solution should not be made up until needed for use*, as it loses strength by standing. Spread the seed wheat out on a clean barn or granary floor and sprinkle with the formaldehyde solution, shovelling the grain over and over until each grain is thoroughly moistened. An ordinary garden watering can can be used in sprinkling, but a three- or four-gallon hand sprayer, such as is used for spraying fruit trees, is even better. When thoroughly moistened, the grain should be shovelled into a heap and covered with a canvas or tarpaulin for two or three hours. The floor on which the work is done should first be sterilized by washing down with the solution of formaldehyde. The method just described will kill the spores or reproductive bodies of the stinking smut, which fill the swollen, blackened, smutted kernels, and which are scattered over the grain in handling and storage by the breaking up of these kernels in the separator. (Note: Commercial 40 per cent formaldehyde sells at about fifty cents a pound (pint) retail, thirty-five cents a pound wholesale, and can be obtained at any retail drug store, either directly or by order on a wholesale house.)

The loose smut fungus develops within the kernel, through infection from smutted heads at flowering time, when the spores are blown from plant to plant by the wind. Unlike the stinking smut, the newly infected kernels do not reveal the presence of the smut within. For the destruction of the loose smut in infected grain, another method is used as follows, known as the Jensen hot water treatment: The seed wheat should be placed, in quantities not to exceed one-half peck each, in loose burlap bags and soaked for five or six hours in water at a temperature of from 63 to 72 degrees Fahrenheit. For this purpose a 50-gallon coal oil barrel is convenient, the sack of grain being hung from a stick laid across the top of the barrel. Meanwhile water should be heated in quantity sufficient to fill two additional barrels with from 20 to 40 gallons of hot water, according to the quantity of seed to be treated. The water for these two barrels should be gotten to a temperature of 129 degrees Fahrenheit. This may be done in one of two ways; first, by heating the water several degrees above this point, pouring it into the barrels, and then testing from time to time by means of a good thermometer hung deep in the water, until it registers 129 degrees. When the water in the two barrels is at the required temperature, the sack of soaked grain from the cold water barrel is immersed for one minute in one of the hot water barrels (which should be marked No. 1) to bring the temperature of the grain up to the required temperature. The sack should then be transferred to the other hot water barrel (marked No. 2), where it is allowed to remain for ten minutes, the sack and water being agitated during the entire time, and the thermometer being carefully watched throughout the operation to see that the temperature of the water is not below 124 or above 131 degrees. If the temperature falls, more hot water must be added, or the time of immersion somewhat lengthened. If the temperature is above 129 degrees the time of immersion must be somewhat shortened. At no time must the temperature exceed 131 degrees. Seed wheat treated as above should then be dried by spreading out on a clean floor and shoveling over repeatedly until it is dry enough to run freely through the drill. A second and better method of managing the hot water is to keep two tanks, boilers, or galvanized iron tubs of sufficient capacity to hold the sack of grain well submerged, constantly at a temperature of 129 degrees over a stove or a gasoline burner, the latter being preferable because it is easier to regulate the heat.

Care must be taken not to get the temperature too high in the bottom of the tank, next the fire. A preliminary trial with a thermometer hung constantly at the depth at which the bag of seed is to hang will enable one to gauge the strength of flame necessary. The greatest advantage of this method of managing the hot water lies in the fact that a larger amount of seed grain can be treated in the same length of time, since a continuous flame enables the operator to keep the water more continuously at the required temperature than by the barrel method, and with less handling of water. The planting of about one-fourth more seed is advisable, to replace any seeds of low vitality which have been injured in the treatment.

A combined treatment for both loose smut and bunt may be given by maintaining the temperature of barrel No. 1 at 120 to 125 degrees and No. 2 at 132 degrees Fahrenheit. As before, the immersion in No. 1 should be for one minute and in No. 2 ten minutes. This method has a certain disadvantage in that the temperature of 132 degrees kills a considerable quantity of grain, which must be made up for by planting from one-fourth to one-half more seed than is ordinarily sown.

Smutted grain of both sorts can easily be recognized in the field. The heads of the plants infected with loose smut are entirely destroyed and the black powdery dust (the spores or reproductive bodies) is blown about by the wind at flowering time and infects the new seeds just forming in the heads. The fungus then develops *inside* these grains and remains invisible, causing no change in the form or appearance of the berry. Such infected seeds may thus go out into the field again. The fungus inside the seed grows up inside the young seedling and makes itself visible at flowering time as before, when it forms a blackened head full of dusty spores which escape and blow away over the field.

The stinking smut changes the form of the kernel, causing it to become black and hard and abnormally large. Within these blackened kernels the wheat substance is entirely consumed by the fungus, which fills the space full of the powdery black spores. As the kernels do not break open, however, the spores do not escape into the field except where the smutted grains are accidentally broken off and trampled into the soil and crushed. When such smutted grains go through the separator, however, many of them are broken to pieces, and the spores within are scattered over the unsmutted grain, adhering in the crease, on the brush, etc.

The stinking smut is ordinarily the more prevalent of the two. Where the loose smut is abundant, change of land for a season is desirable. This will allow the smut spores that become scattered over the soil by the wind to germinate and die. If wheat is planted on land badly infected with loose smut, there is danger of the smut spores on the ground germinating and sending their germ tubes into the wheat when it germinates.

Approved:

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